Exploring The Emerging Trends of Reusable Shipping Packaging for E-Commerce

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***Abstract* – The rapid growth of e-commerce in terms of transaction volume and value has raised environmental concerns because of the potential for packaging waste it generates. Single-use shipping packages often result in piles of waste from cardboard, plastic and seal tape after the product is received by consumers. On the other hand, the customers of e-commerce products are also reported to be uncomfortable with shipping packaging which is often considered excessive. This problem gave birth to an innovative solution in the form of reusable shipping packaging for e-commerce product. This solution certainly considered interesting and promising, nevertheless, the scientific studies that address this issue are still limited. Therefore, this study aims to explore e-commerce shipping packaging, particularly in terms of its identifying attributes and seeking possible patterns. The findings are discussed using a descriptive analysis approach. As a result, it is found that several companies have launched products and services related to reusable e-commerce shipping packaging, and there are indications of certain patterns that are interrelated between these packaging attributes. This study hopes to contribute to the academic literature in the field of e-commerce reusable packaging, which is considered still in the infancy period.**
Keywords – packaging, shipping, delivery, design, reuse, e-commerce.

I. INTRODUCTION

Over the past decade, electronic commerce (e-commerce) has grown tremendously in terms of adoption and transaction value. Nowadays, shopping through the internet is considered as a convenient way to purchase goods compared driving to stores or other shopping centres, particularly during the pandemic situation. Data from the United Nations Conference on Trade and Development (UNCTAD) in 2018 alone estimates that there are 1.45 billion people buying something through the internet [1].

In regards to value, the global e-commerce transaction has reached $25.6 trillion, which was equivalent to 30% of world gross domestic product (GDP) from that year [1]. Euromonitor predicts that in the year 2022, e-commerce shall become the largest retail commercial channel in the world, surpassing the conventional grocery retail outlet [2].

With the enormous growth of the numbers, it also comes with consequences. The excess of single-use delivery packaging for protection during transport raising the environment concerns [3]. In China's Singles Day 2020 event -which is crowned as the biggest e-commerce event in the world- it is reported shipping nearly 4 billion packages, in which 20 per cent of the packages are plastic-based [4]. In 2017, it is estimated the single-use packaging used during the Singles Day produce more than 160,000 tonnes of packaging waste, which include cardboard, plastic and seal tape [5] [6].

In some countries, private sectors have already started to solve the problem of single-use delivery packaging by introducing reusable shipping packaging for consumer delivery [7]. This innovative solution could reduce the unnecessary packaging waste for the consumer because the container that contains the delivered goods could be used multiple times compared to just a single-use [8]. This is good news from the environmental perspectives.

Nevertheless, the academic studies discussing this matter in considerably scarce. This is understandable because the technology is still emerging and adoption of this new innovative approach is still in the infancy phase for several countries. Having the gap described above, therefore the central discussion of this paper would like to address the emerging trend of reusable packaging in the e-commerce sector in an exploratory manner.

II. LITERATURE REVIEW

Reusable packaging is packaging which has been conceived, designed and marketed to carry out multiple trips in its lifetime by being refilled or reused for the same purpose for which it was conceived (European Commission 2002a). While the jargon of 3R: Reduce, Reuse, Recycle has been introduced to our society for a considerable time, yet most of the scholars' works regarding the 3R are concentrated unevenly in recycling or composting, the reuse is the least of the three [9].

Golding is one of the early scholars to examine the landscape of reusable packaging in Europe [10]. The research explored the state of reusable primary packaging in European countries, the cost and constraint, also giving the recommendation. Babader has been investigating reusable primary packaging for minimizing waste [9]. The study tries to understand the influential factors of community behaviour to adopt the reusable packaging, develop the design guideline for reusable packaging, and assess the potential environmental impact for reusable packaging.

In the business to business (B2B) settings, the reusable packaging concept is also known with other terms such 'returnable transport items' (RTI), 'returnable transport packaging' (RTP), and 'returnable containers'. The situation is mostly around the logistic flow between the supplier and manufacturer or wholesaler and this dynamic is often recognized as 'closed-loop supply chain' [11].

Weizhen, Qiping & Xue had published a study about the evaluation of China delivery courier 'green' packaging

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initiatives [12]. They evaluated nine China courier companies with 29 indicators related to sustainability action and thus giving recommendations. Albeit investigating the reusable containers as an effort to make the logistic delivery more sustainable, the study is limited only in mainland China.

Xu has analyzed the driver and barrier of reusable shipping e-commerce packaging which dissect it from cultural, regulatory, market and technology perspective. Further, the study also analyzes the environmental impact of the packaging samples [8].

In the e-commerce transaction delivery packaging, excessive packaging is one among the problems plaguing this field. For the e-commerce consumer, what is important is the purchased goods retrieved in excellent quality, however, the circumstances of bizarre e-commerce packaging delivering the goods are regularly found [13]. The large packaging box often contains just one or two small items and a lot of filler material is reported frustrating customers because of the packaging inefficiency and wastefulness [14] [15].

Coelho and colleagues had done a study about the sustainability aspect of various reusable packaging [16]. They use terms transit packaging for packaging that is used in transporting or shipping either perishables or non-perishable goods. The study also suggests that reusable packaging systems have indicated the potential of environmental and economic benefits when compared with single-use packaging systems.

Regarding innovation, the study from Escursell and colleagues highlights the latest innovation in sustainable shipping packaging solutions for e-commerce [7]. It is recognizing both disposable approaches such as Scudopack - solution to protect furniture with the least amount of cardboard used; and the reusable approach, such as Repack - reusable packaging service designed for e-commerce.

III. RESEARCH METHOD

Research Design

In general, this study would be categorized as qualitative research and the results would be analyzed through descriptive manner. Scholars have described many purposes of descriptive research. Some that considered relevant with this research are: (1) to discover relationships or associations among or between variables that have been selected [17]; and (2) to portray the characteristics of persons, situations, or groups and the frequency with which certain phenomenon happened [18];.

Furthermore, this research also have matching characteristics for descriptive studies, such as: (1) The purpose is to describe one or more variables and/or determine if there is an association between two or more variables, while determining causal relationships is not the goal; and (2) Not stating hypothesis is a common practice. The outcome of a good descriptive study is the development of the database from which then hypotheses may be emerged, furthermore to be tested in future studies [19]. Nevertheless, the research design could be depicted using the diagram below:

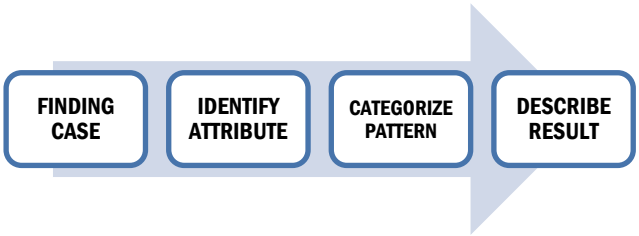

Figure 1. The Step of Research Design

Finding Case. This stage conducted using a purposive sampling approach. The search will be operated through Google search engine and Google Scholar search engine, both seeking keywords related to reusable e-commerce packaging.

Identify Attribute. Any prominent feature or characteristic found will be highlighted and identified. This will make coding organization easier.

Categorize Pattern. This step will extract common themes and concept found. The significant recurring phrase or similar feature will be clustered.

Describe the Result. The outcome of the previous step then will be compared and discussed further. Considering the small range of results and the simplicity of this research aim, the analysis will be conducted through human analysis, not necessarily utilizing qualitative data analysis software.

Research Scope and Results Filtering.

Due to limited budget and time, this research will only focus on (1) Reusable e-commerce packaging that delivered to individual customers. Therefore, packaging that used only in business to business (B2B) setting will not be discussed; (2) The reusable packaging should be intended to be returned or re-circulated back in the fulfilment delivery systems; (3) The case should still clearly exist or still actively operating during the time of this research conducted, any ceased operation or unclear presence will not be included; and (4) The finding results that would be analyzed should be in English language.

Albeit with the described limitation, the results supposedly still could give a representative picture of reusable transit packaging trends that is happening in the e-commerce industry in recent time.

IV. RESULT AND DISCUSSION

Case Found

After searching, identifying and filtering for the sample, we found several businesses that provide reusable packaging for e-commerce activity.

Table 1. The Case Found and Sources

Case	Source
Huidu Environment	[20] [21] [22]
LimeLoop	[23]
Living Packets	[24]
Liviri	[25] [26] [27] [28]
Rent The Runway	[29] [30]
RePack	[31] [32] [33] [7]
Returnity	[34] [35] [36]

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Huidu Environment. This Shanghai-based company is providing delivery boxes that could be used up to 20 times and could be rented on a monthly, yearly or per-use basis, mainly for e-commerce delivery and logistics companies. There is three variant of packages: ZerOBox is used mainly for delivering consumer electronics products; CoolBox has a food-grade inner layer that can be used for delivering food and fresh flowers; ZerOBag is waterproof mailer and designed for document delivery.

Figure 2. ZerOBox (source: huidugroup.cn)

LimeLoop. LimeLoop is a reusable package that made of upcycled billboard vinyl and recycled cotton. The recyclable package is available in small, medium, and large size and ready for reuse over 200 times. LimeLoop also provides a digital platform to track the package, measure environmental impact and do predictive analysis.

Figure 3. LimeLoop Bag (source: thelimeloop)

Living Packets. Living Packets is Berlin-based startup that offers package as a service and aims to replace the cardboard box with a smart delivery package which called The Box. The Box now already in the second version and have several features such as sensors that could send information regarding inside package temperature, humidity and shock; electronic ink display for delivery address; and 4G connection enabled. The Box cost 100 times than usual card box but could be used for over 1000 cycles.

Figure 4. The Box (source: livingpackets.com)

Liviri. Liviri is reusable insulated boxes for delivering e-commerce grocers and alcoholic beverages, provided with custom ice packs that fit inside the container. It has three types of boxes: Liviri Fresh for home delivery of temperature-sensitive perishable items; Liviri Shuttle for delivering grocery, food and farm-produced crops with more than 12 hours of thermal performance; and Liviri Vino for wine delivery which provides 5 days of thermal protection. These boxes can be used up to 75 delivery cycle.

Figure 5. Liviri Fresh Container (source: fastcompany.com)

Rent The Runway. Rent The Runway is an online service where subscribed customers could rent designer dress and accessory. Rent The Runway has launched the reusable Garment Bag in May of 2015 with 5000 bags, now there are over 100,000 bags circulated.

Figure 6. Rent The Runway Garment Bag (source: amraninc.com)

RePack. This award-winning Helsinki-based business is providing reusable package mainly for the fashion e-commerce company. Founded in 2011, now providing reusable packaging for more than 90 brands in Europe and North America. Repack mailer is their main service and could be used up to 20 times delivery.

Figure 8. Returnity Chrysalis Mailer Bag which reversible inside-out (source: returnity.com)

Figure 7. Repack Mailer Bag (source: neonyt.messefrankfurt.com)

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Returnity. Founded in 2014 in the United States of America, Returns largely provide customized reusable shipping packaging for brands, with Chrysalis model as the main popular product which the mailer bag could be turned inside out for customer personal use. Returnity also could customize the packaging design depending on the brands' needs.

Identification & Description

After examining the selected case, the finding could be summarized in table 2 and the description would be described below.

Table 2. Reusable Packaging Attributes

Company Name	Country Origin	Product Name	Durability (Cycles)	Container Purpose	Physical Design	Circulation Area	Container Ownership
Huidu Environment	China	ZerOBox	20	Electronics, clothes, other consumer goods	Container Box	China	Huidu
		CoolBox	N/A	Fresh foods	Container Box		
		ZerOBag	N/A	Documents	Mailer Bag		
LimeLoop	USA	LimeLoop	200	Clothes	Mailer Bag	USA	Brand / Store
Living Packets	Germany	The Box	1000	Consumer goods	Container Box	Europe	Living Packets
Liviri	USA	Liviri Fresh	75	Perishable item	Container Box	USA	Brand / Store
		Liviri Vino	75	Wine	Container Box		Brand / Store
		Liviri Shuttle	75	Fresh produce, food & groceries	Container Box		Brand / Store
Rent The Runway	USA	Rent The Runway Garment Bag	60	Clothes, Accessories	Garment Bag	USA	Rent The Runway
RePack	Finland	RePack Mailers	20	Clothes	Mailer Bag	Europe & North America	Brand / Store
Returnity	USA	Chrysalis	40	Clothes	Mailer Bag	North America & Europe	Brand / Store

Country Origin. Almost all of our sample founded in developed nations, except Huidu Environment which came from China. We would argue that the opportunity to start implementing the reusable shipping packages in these countries is an outcome from pressures and incentives of cultural, regulatory, market, technology and consumers [8]. For example, the European Union have put target that by 2030 all plastic packaging is reusable or recyclable in a cost-effective manner [37]. Furthermore, in the year 2015, RePack managed to secure a grant from the European Union for its innovative effort [38]. This shows that there is an advantage to build innovative environmental concern business in a certain region or nation, in this case, is Finland and Europe. The government of China also has published Guidelines for Green Packaging in the Express Delivery Industry which provides the objectives for green packaging in the industry, in context of standardization, reduction and recycling, strengthening coordination upstream and downstream, also reduction and reuse of packaging materials [12].

Durability. The endurance of the container is related to the material used to build the packaging. From the case that has been picked we see that The Box is claimed could be used over than 1000 cycle. Living Packets described it is build using Expanded Polypropylene (EPP), which have a favourable characteristic such as phenomenal energy absorption, multiple impact resistance, water and chemical resistance, thermal insulation, buoyancy, outstandingly high strength to weight ratio and 100% recyclability [39]. While RePack mailer bag using recycled polypropylene as their main material, which polypropylene (PP) itself has benefited such as its availability and relatively inexpensive price, has high flexural strength, very resistant to absorbing moisture, has good chemical resistance over a wide range of bases and acids, and also good resistance from fatigue. Nevertheless, PP has some weakness as packaging materials such as thermal expansion coefficient, deteriorate to ultraviolet rays, has poor resistance to chlorinated solvents and aromatics, and susceptible to oxidation [40].

Container Purpose. From the sampled case, we found that many of the packages are suitable to deliver clothes. We would argue this is because clothes have minimum package requirements compared with perishable or fragile goods for example. The perishable goods need additional features such as ice packs and thermal divider in Liviri's container, or special layer in Huidu's box. The fragile goods require additional filler or feature to absorb potential shocks during delivery, such as 'automatic holding system' that is present in The Box by Living Packet.

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Physical Design. There is an indication of the correlation between physical form and the main purpose of the package. The form of mailer bag is suitable for document and clothes. The garment bag is appropriate and handy to carry clothes in minimum folding which is to prevent wrinkles. The structure of the container box gives benefit to protect the content, therefore it is convenient to deliver perishable goods such as fresh produce and also suitable for fragile goods i.e electronics.

Circulation Area. Through our analysis, we would like to suggest two factors that influence the circulation area of the container. First, the duration of establishment, where the older of the company age potentially affect a larger area. This is shown by RePack which already established since 2011 and supplying for more than 90 e-commerce brands in Europe and recently North America. Second, the returned model, where the more simple the model, the more potential it would reach a larger area. This is the case of Returnity, where they just sell the bag to the e-commerce brands and did not take the responsibility to handle bag cleaning that is sent from the customers. Now their bag already used by e-commerce store based in North America and Europe.

Container Ownership. As we could see, there are two types of ownership. First, the packaging company owns the container, while the brands or stores rent it from them. Therefore, repairing damaged containers is the responsibility of the packaging company. This type is also called as "packaging-as-a-service", and used by Living Packets and Huidu Environment. Second, the e-commerce store own the container, either they bought from the packaging company (such in case of RePack or Returnity) or they develop their bag themselves (such in case of Rent The Runway).

V. CONCLUSION

This paper tries to contribute to the knowledge of reusable shipping packaging for e-commerce which is still infancy in the scientific literature. In the previous part, we have discussed the 7 (seven) case found in the recent landscape of reusable shipping e-commerce packaging, also identifying their attributes, and describing the findings. Some attributes that have been identified are country origin, durability, container purpose, physical design, circulation area, and container ownership. In conclusion, there is some kind of pattern of one attributes and another, such as between the purpose and the physical design.

A further suggestion is to examine thoroughly the attributes, conduct in-depth analysis, using a more extensive research method and comprehensive sample. Another suggestion is to study the reusable shipping packaging for e-commerce in the business to business (B2B) context. It is also interesting to further explore the type of business model of these reusable shipping packaging companies and how it corresponds with their growth or circulation area.

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